WHAT IS CLAIMED IS:

1. An electron beam apparatus for inspecting a sample, comprising:

a plurality of electron guns for emitting a plurality of primary electron beams, each of the electron guns comprising a mechanism for adjusting a relative position between a cathode and anode.

2. An electron beam apparatus according to Claim 1 wherein the adjusting mechanism of each of the electron guns comprises:

an insulator supporting the cathode; and

a plurality of piezo elements supporting the insulator, the piezo elements having lengths that vary depending on voltages which are applied thereto.

3. An electron beam apparatus according to Claim 1, wherein each of the electron guns further comprises a metal member located near the cathode, for reflecting radiation generated from the cathode to a portion around the tip of the cathode.

4. An electron beam apparatus according to Claim 2, wherein each of the electron guns further comprises a metal member located near the cathode, for reflecting radiation generated from the cathode to a portion around the tip of the cathode and preventing materials evaporating from the cathode and/or an Wehnelt from attaching to the insulator.

5. An electron beam apparatus according to any one of Claims 1-4, wherein the cathode of the electron gun is a thermal electron emission gun, and the electron gun is

adapted to emit an electron beam which provides brightness greater than the Langmuir limit.

6. An electron beam apparatus for inspecting a sample, comprising:

a plurality of electron guns for emitting a plurality of primary electron beams; and

a plurality of lenses respectively corresponding to the electron guns, for converging the primary electron beams emitted from the electron guns, wherein

the lenses comprises a plurality of laminated insulation plates each of which has throughholes at portions respectively corresponding to optical axes of the primary electron beams, and

each of the laminated insulation plates has a plurality of lens electrodes made by dividing a metal coating layer on the insulation plate correspondingly to the throughholes therein.

7. An electron beam apparatus for inspecting a sample, comprising:

a plurality of electron guns for emitting a plurality of primary electron beams; and

a plurality of electro-magnetic deflectors respectively corresponding to the electron guns, for deflecting secondary electron beams emitted from the sample, wherein

each of the electro-magnetic deflectors comprises:

a pair of ferromagnetic materials located at opposing sides on a circle and having an arc shape; and

a pair of permanent magnets located at opposing sides on the circle, the same poles of the respective permanent magnets facing each other to generate magnetic flexes in opposing directions.

8. An electron beam apparatus for inspecting a sample, comprising:

a plurality of electron guns for emitting a plurality of primary electron beams;

a plurality of ExB separators respectively corresponding to the electron guns, for separating secondary electrons emitted from the sample from primary optical systems, wherein

the ExB separators comprise:

a plurality of electrostatic deflectors comprising throughholes provided at potions of an insulation plate correspondingly to axes of the primary electron beams, and a plurality of electrodes in grooves which devide portions around the respective throughholes of the insulation plate; and

a plurality of electromagnetic deflectors respectively located around the electrostatic deflectors.

9. An electron beam apparatus for inspecting a sample, comprising

a plurality of electron guns for emitting a plurality of primary electron beams, the electron guns comprising:

a plurality of Wehnelt electrodes comprising a plurality of Wehnelt throughholes located at

portions of an Wehnelt plate respectively corresponding to axes of the primary electron beams emitted from the electron guns, and thin portions around the respective Wehnelt throughholes of the Wehnelt plate;

a plurality of cathodes having the same axes as those of the respective Wehnelt throughholes; and

a plurality of anodes comprising throughhoples in a plate, the throughholes having the same axes as those of the Wehnelt throughholes.

10. An electron beam apparatus for detecting defects in a sample, comprising:

a mechanism for setting a pixel size to be approximately equal to a minimum line width of the sample; and

a mechanism for providing a Modulation Transfer Function (MTF) of a secondary electron detection signal at 0.55 or more when a line and space pattern having the minimum line width is scanned, thereby capable of detecting defects having a size about one-half of the pixel size or smaller.

11. An electron beam apparatus for detecting defects in a sample, comprising:

a mechanism for setting a pixel size to be approximately equal to a minimum line width; and

a mechanism for providing a signal/noise ratio (S/N) of a secondary electron detection signal at 20 or more where the noise N is a 3σ value, thereby capable of detecting defects having about one-half of the pixel size

or smaller.

12. An electron beam apparatus according to Claim 10 or 11, wherein the sample is a mask comprising a stencil or membrane mask, and the electron beam apparatus comprises:

an electron gun for emitting an electron beam;

an optical system for condensing the electron beam to irradiate the mask therewith;

an optical system for enlarging an electron beam which has been passed through the mask, to provide a transmission electron beam; and

an imaging apparatus for capturing an image of the mask from the transmission electron beam.

13. An electron beam apparatus comprises:

an electron gun for emitting an electron beam;

an optical system for condensing the electron beam to irradiate the sample therewith;

an optical system for enlarging an electron beam which has been passed through the sample, to provide a transmission electron beam;

an imaging apparatus for capturing an image of the sample from the transmission electron beam; and

defect-detection circuit for detecting defects on the sample from the image by die-to-die comparison or cell-to-cell comparison.

14. A method of setting an electron beam apparatus which comprises a plurality of electron guns, to detect a defect on a sample having a size equal to less than one-half of a pixel size, comprising the steps of:

setting the electron guns to operate in the space charge limiting region so that a shot noise reduction coefficient is equal to a predetermined value; and

setting a Modulation Transfer Function (MTF) of a secondary electron detection signal at 0.55 or more when a line and space patter having a minimum line width is scanned, by focussing the beam size sufficiently small.